

CLAIMS

1. An imaging system comprising:

an imaging device which picks up an image signal in an image format of 24 frames/second;

5 a temporary recording device which temporarily records the image signal picked up by the imaging device; and

a 2:3:3:2 pull-down control device which reads the image signal from the temporary recording device in an interlace format of 60 fields/second,

10 wherein the 2:3:3:2 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

15 reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third and fifth field data;

reading even field data of the second frame as the fourth field data;

20 reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth and eighth field data;

25 reading odd field data of the fourth frame as the ninth field data; and

reading even field data of the fourth frame as the tenth field data.

2. An image conversion system comprising:

30 an input device to which an image signal having an image format of 24 frames/second is input;

a temporary recording device which temporarily records the image signal to be input to the input device; and

a 2:3:3:2 pull-down control device which reads the image

signal from the temporary recording device in an interlace format of 60 fields/second,

wherein upon reading first to fourth consecutive frame data of the image signal from the temporary recording device as first to tenth consecutive field data, the 2:3:3:2 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third and fifth field data;

reading even field data of the second frame as the fourth field data;

reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth and eighth field data;

reading odd field data of the fourth frame as the ninth field data; and

reading even field data of the fourth frame as the tenth field data.

3. The imaging system according to claim 1, further comprising a recording device which records the image signal converted by the 2:3:3:2 pull-down control device in an interlace system of 60 fields/second.

4. The imaging system according to claim 3, further comprising a compressing device which, with respect to the first to tenth field data read from the temporary recording device, combines paired field data with each other into a piece of frame data, and then compresses the resulting data,

wherein the recording device records the image signal that has been compressed by the compressing device.

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6. An image-editing device comprising:

an input device to which a compressed image signal in an interlace system having a format of 60 fields/second, which has been combined and compressed on a frame basis, is input;

a frame-data extracting control device which selectively extracts from the input device the first, second, fourth and fifth frame data among the first to fifth frame data that form the compressed image signal and are consecutively arranged with each other;

a recording/reproducing device which records/reproduces the compressed image signal extracted by the frame-data extracting control device;

an image expanding device which expands the compressed image signal reproduced by the recording/reproducing device;

an image output device which displays the expanded image signal; and

an editing device which edits the compressed image signal reproduced from the recording/reproducing device on a frame basis.

7. An imaging system comprising:

an imaging device which picks up a first image signal in an image format of 24 frames/second;

a temporary recording device which temporarily records the first image signal picked up by the imaging device; and

a 2:3:3:2 pull-down control device which reads the first image signal from the temporary recording device as a second image signal having an image format of 30 frames/second,

5 wherein the 2:3:3:2 pull-down control device carries out the controlling steps of:

converting field data located at odd fields of a frame corresponding a time-code value $4n$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n$ of the second image signal;

10 converting field data located at even fields of a frame corresponding a time-code value $4n$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n$ of the second image signal;

15 converting field data located at odd fields of a frame corresponding a time-code value $4n + 1$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 1$ of the second image signal;

20 converting field data located at even fields of a frame corresponding a time-code value $4n + 1$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 1$ of the second image signal;

25 converting field data located at odd fields of a frame corresponding a time-code value $4n + 1$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 2$ of the second image signal;

converting field data located at even fields of a frame corresponding a time-code value $4n + 2$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 2$ of the second image signal;

30 converting field data located at odd fields of a frame corresponding a time-code value $4n + 2$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 3$ of the second image signal;

converting field data located at even fields of a frame corresponding a time-code value $4n + 2$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 3$ of the second image signal;

5 converting field data located at odd fields of a frame corresponding a time-code value $4n + 3$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 4$ of the second image signal; and

10 converting field data located at even fields of a frame corresponding a time-code value $4n + 3$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 4$ of the second image signal (where n is an integer of 0 to 5).

15 8. The imaging system according to claim 7, further comprising: a recording device that records the second image signal on a recording medium,

wherein the recording device records the second image signal on the recording medium by a unit of 5 frames that corresponds to 1 sequence of the second image signal.

20 9. The imaging system according to claim 8, further comprising: a recording start signal generator that generates a recording start signal that is set to a unit of 5 frames that corresponds to 1 sequence of the second image signal.

25 10. The imaging system according to claim 8, further comprising: a time-code reading device that reads the time code of the second image signal recorded on the recording medium,

wherein the recording device starts a recording process of the second image signal in phase-synchronism with the time code read by the time-code reading device.

30 11. The imaging system according to claim 8, wherein the recording device records the second image signal based upon an interlace system of 60 fields/second.

12. The imaging system according to claim 11, further

comprising a compressing device which, with respect to the field data read from the temporary recording device, combines paired field data with each other into a piece of frame data, and then compresses the resulting data,

5 wherein the recording device records the image signal that has been compressed by the compressing device.

13. An image conversion system comprising:

an input device to which a first image signal having an image format of 24 frames/second is input;

10 a temporary recording device which temporarily records the first image signal to be input to the input device; and

a 2:3:3:2 pull-down control device which reads a second image signal from the temporary recording device in an image format of 30 frames/second,

15 wherein the 2:3:3:2 pull-down control device carries out the controlling steps of:

converting field data located at odd fields of a frame corresponding a time-code value $4n$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n$ of the second image signal;

converting field data located at even fields of a frame corresponding a time-code value $4n$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n$ of the second image signal;

25 converting field data located at odd fields of a frame corresponding a time-code value $4n + 1$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 1$ of the second image signal;

converting field data located at even fields of a frame corresponding a time-code value $4n + 1$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 1$ of the second image signal;

converting field data located at odd fields of a frame

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corresponding a time-code value $4n + 1$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 2$ of the second image signal;

5 converting field data located at even fields of a frame corresponding a time-code value $4n + 2$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 2$ of the second image signal;

10 converting field data located at odd fields of a frame corresponding a time-code value $4n + 2$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 3$ of the second image signal;

15 converting field data located at even fields of a frame corresponding a time-code value $4n + 2$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 3$ of the second image signal;

converting field data located at odd fields of a frame corresponding a time-code value $4n + 3$ of the first image signal to field data located at odd fields of a frame corresponding a time-code value $5n + 4$ of the second image signal; and

20 converting field data located at even fields of a frame corresponding a time-code value $4n + 3$ of the first image signal to field data located at even fields of a frame corresponding a time-code value $5n + 4$ of the second image signal (where n is an integer of 0 to 5).

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15. An image-editing device comprising:

an input device to which a compressed image signal in an interlace system having a format of 60 fields/second, which has been combined and compressed on a frame basis, is input;

5 a frame-data extracting control device which extracts pieces of frame data located at frame positions corresponding to time-code values of $5n$, $5n + 1$, $5n + 3$, $5n + 4$ (n : an integer of 0 to 5) from the input device;

10 a recording/reproducing device which records/reproduces the compressed image signal extracted by the frame-data extracting control device;

an image expanding device which expands the compressed image signal reproduced by the recording/reproducing device;

an image output device which displays the expanded image signal; and

15 an editing device which edits the compressed image signal reproduced from the recording/reproducing device on a frame basis.

16. An imaging system comprising:

20 an imaging device which picks up an image signal in an image format of 24 frames/second;

a temporary recording device which temporarily records the image signal picked up by the imaging device;

25 a reading device which reads the image signal from the temporary recording device based upon an interlace system of 60 fields/second;

30 a pull-down control device which is provided with a plurality of corresponding relationships between each frame of the image signal having the image format of 24 frames/second and each field of the interlace image signal having the image format of 60 fields/second, and based upon one corresponding relationship selected from the corresponding relationships, controls the reading operation of the reading device; and

a switching device which switches the corresponding

relationships to be selected by the pull-down control device.

17. An imaging system comprising:

an input device to which an image signal having an image format of 24 frames/second is input;

5 a temporary recording device which temporarily records the image signal to be input to the input device;

a reading device which reads the image signal from the temporary recording device based upon an interlace system having an image format of 60 fields/second;

10 a pull-down control device which is provided with a plurality of corresponding relationships between each frame of the image signal having the image format of 24 frames/second and each field of the interlace image signal having the image format of 60 fields/second, and based upon one corresponding
15 relationship selected from the corresponding relationships, controls the reading operation of the reading device; and

a switching device which switches the corresponding relationships to be selected by the pull-down control device.

18. An imaging system comprising:

20 an imaging device which picks up an image signal in an image format of 24 frames/second;

a temporary recording device which temporarily records the image signal picked up by the imaging device;

a reading device which reads the image signal from the
25 temporary recording device based upon an interlace system of 60 fields/second;

a 2:3:3:2 pull-down control device which controls the reading device;

a 2:3:2:3 pull-down control device which controls the
30 reading device; and

a switching device which switches control operations of the reading device between the 2:3:3:2 pull-down control device and the 2:3:2:3 pull-down control device,

wherein, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:3:3:2 pull-down control device carries out the controlling steps of:

- 5 reading odd field data of the first frame as the first field data;
- reading even field data of the first frame as the second field data;
- reading odd field data of the second frame as the third
- 10 and fifth field data;
- reading even field data of the second frame as the fourth field data;
- reading odd field data of the third frame as the seventh field data;
- 15 reading even field data of the third frame as the sixth and eighth field data;
- reading odd field data of the fourth frame as the ninth field data; and
- reading even field data of the fourth frame as the tenth
- 20 field data, while, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:3:2:3 pull-down control device carries out the controlling steps of:
- reading odd field data of the first frame as the first
- 25 field data;
- reading even field data of the first frame as the second field data;
- reading odd field data of the second frame as the third and fifth field data;
- 30 reading even field data of the second frame as the fourth field data;
- reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth field data;

reading odd field data of the fourth frame as the ninth field data; and

5 reading even field data of the fourth frame as the eighth and tenth field data.

19. An image conversion system comprising:

an input device to which an image signal having an image format of 24 frames/second is input;

10 a temporary recording device which temporarily records the image signal to be input to the input device;

a reading device which reads the image signal from the temporary recording device based upon an interlace system having an image format of 60 fields/second;

15 a 2:3:3:2 pull-down control device which controls the reading device;

a 2:3:2:3 pull-down control device which controls the reading device; and

20 a switching device which switches control operations of the reading device between the 2:3:3:2 pull-down control device and the 2:3:2:3 pull-down control device,

wherein, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:3:3:2 pull-down control device carries out the controlling steps of:

25 reading odd field data of the first frame as the first field data;

reading even field data of the first frame as the second field data;

30 reading odd field data of the second frame as the third and fifth field data;

reading even field data of the second frame as the fourth field data;

reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth and eighth field data;

5 reading odd field data of the fourth frame as the ninth field data; and

reading even field data of the fourth frame as the tenth field data, while, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:3:2:3 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

15 reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third and fifth field data;

reading even field data of the second frame as the fourth field data;

20 reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth field data;

25 reading odd field data of the fourth frame as the ninth field data; and

reading even field data of the fourth frame as the eighth and tenth field data.

20. An imaging system comprising:

30 an imaging device which picks up an image signal in an image format of 24 frames/second;

a temporary recording device which temporarily records the image signal picked up by the imaging device;

a reading device which reads the image signal from the

temporary recording device based upon an interlace system of 60 fields/second;

a 2:3:3:2 pull-down control device which controls the reading device;

5 a 2:3:2:3 pull-down control device which controls the reading device;

a 2:2:2:4 pull-down control device which controls the reading device; and

10 a switching device which switches control operations of the reading device among the 2:3:3:2 pull-down control device, the 2:3:2:3 pull-down control device and the 2:2:2:4 pull-down control device,

wherein, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:3:3:2 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

20 reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third and fifth field data;

reading even field data of the second frame as the fourth field data;

25 reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth and eighth field data;

30 reading odd field data of the fourth frame as the ninth field data; and

reading even field data of the fourth frame as the tenth field data, while, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first

to tenth consecutive field data, the 2:3:2:3 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

5 reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third and fifth field data;

10 reading even field data of the second frame as the fourth field data;

reading odd field data of the third frame as the seventh field data;

reading even field data of the third frame as the sixth field data;

15 reading odd field data of the fourth frame as the ninth field data; and

reading even field data of the fourth frame as the eighth and tenth field data, while, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:2:2:4 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

25 reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third field data;

reading even field data of the second frame as the fourth field data;

30 reading odd field data of the third frame as the fifth field data;

reading even field data of the third frame as the sixth field data;

reading odd field data of the fourth frame as the seventh and ninth field data; and

reading even field data of the fourth frame as the eighth and tenth field data.

5 21. An imaging system comprising:

an input device to which an image signal having an image format of 24 frames/second is input;

a temporary recording device which temporarily records the image signal to be input to the input device;

10 a reading device which reads the image signal from the temporary recording device based upon an interlace system having an image format of 60 fields/second;

a 2:3:3:2 pull-down control device which controls the reading device;

15 a 2:3:2:3 pull-down control device which controls the reading device;

a 2:2:2:4 pull-down control device which controls the reading device; and

20 a switching device which switches control operations of the reading device among the 2:3:3:2 pull-down control device, the 2:3:2:3 pull-down control device and the 2:2:2:4 pull-down control device,

25 wherein, upon allowing the reading device to read first to fourth consecutive frame data of the image signal as first to tenth consecutive field data, the 2:3:3:2 pull-down control device carries out the controlling steps of:

reading odd field data of the first frame as the first field data;

30 reading even field data of the first frame as the second field data;

reading odd field data of the second frame as the third and fifth field data;

reading even field data of the second frame as the fourth

field data;
 reading odd field data of the third frame as the seventh
 field data;
 reading even field data of the third frame as the sixth
 5 and eighth field data;
 reading odd field data of the fourth frame as the ninth
 field data; and
 reading even field data of the fourth frame as the tenth
 field data, while, upon allowing the reading device to read first
 10 to fourth consecutive frame data of the image signal as first
 to tenth consecutive field data, the 2:3:2:3 pull-down control
 device carries out the controlling steps of:
 reading odd field data of the first frame as the first
 field data;
 15 reading even field data of the first frame as the second
 field data;
 reading odd field data of the second frame as the third
 and fifth field data;
 reading even field data of the second frame as the fourth
 20 field data;
 reading odd field data of the third frame as the seventh
 field data;
 reading even field data of the third frame as the sixth
 field data;
 25 reading odd field data of the fourth frame as the ninth
 field data; and
 reading even field data of the fourth frame as the eighth
 and tenth field data, while, upon allowing the reading device
 to read first to fourth consecutive frame data of the image signal
 30 as first to tenth consecutive field data, the 2:2:2:4 pull-down
 control device carries out the controlling steps of:
 reading odd field data of the first frame as the first
 field data;

reading even field data of the first frame as the second
field data;

reading odd field data of the second frame as the third
field data;

5 reading even field data of the second frame as the fourth
field data;

reading odd field data of the third frame as the fifth
field data;

10 reading even field data of the third frame as the sixth
field data;

reading odd field data of the fourth frame as the seventh
and ninth field data; and

reading even field data of the fourth frame as the eighth
and tenth field data.

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